

APPRAISAL OF FOSSIL RESOURCES AND SPECIMENS

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Abstract—Appraisal and assessment of paleontological resources and fossil specimens play important roles in the management of paleontological resources on federal lands. Appraisals are opinions of market value while assessments are estimates of value. The former are prepared by licensed or certified professional appraisers; the latter may be prepared by a professional, but not necessarily an appraiser. Valuations can include the appraisal of fossil specimens for litigation and museum property purposes; resource value estimates and damage assessments for fossil theft cases; and resource value estimates for lands actions. Paleontological resource values can be categorized into two types: natural resource value — scientific and heritage — and fair-market or commercial value. Natural resource values are intangible non-market values and may include scientific, museum and heritage values, as well as resource potential. Fair-market appraisals of fossil resources, whether as real or personal property, can be estimated using standard appraisal methods. The comparable sales method may work best in the appraisal of fossil specimens for litigation purposes. The approach is straightforward. It is tied to whatever price a buyer is willing to pay, and what the market will bare. In 1997, “Sue,” the most complete *Tyrannosaurus rex* fossil specimen at the time, sold at auction for \$8.36 million.

INTRODUCTION

Paleontological resources are important natural resources and national assets in the management of federal lands. The scientific value of paleontological resources is without question. Fossils are evidence of past life on Earth and are indispensable indicators of geologic time in the stratigraphic record. Fossils allow scientists to study changes in paleoecosystems and paleoclimates, both essential tools to understanding the history of life. Recognition by the Federal Accounting Standards Advisory Board (FASAB) of the importance of stewardship resources, including “heritage assets” and “stewardship lands,” and the government’s responsibility for and accountability of these resources has furthered the importance of paleontological resources as “uniquely governmental” assets. Such programs as “Preserve America” and “Save America’s Treasures” have brought additional recognition of paleontological resources as having heritage values in concert with the traditional cultural and historical resources. Fossil resources on federal lands, particularly fossils occurring on federal lands with protective mandates, such as the National Park Service, and multiple-use mandates, such as the Bureau of Land Management and the Forest Service, are important national treasures to be enjoyed by all. With the ever-increasing fascination of dinosaur fossil discoveries and the increasing popularity of participation in fossil digs, federal paleontological resources fall prey to the increased likelihood of fossil theft and vandalism. Therefore, the appraisal and assessment of paleontological resources become important tools in the management and accountability of this uniquely governmental asset.

APPRAISAL VS. ASSESSMENT

An appraisal is an opinion of market value of a specific type of property in a specific period of time by a professional appraiser. Professional appraisers are usually certified or licensed by a professional trade organization in a particular area of expertise, and issue opinions (appraisals) in accordance with the “Uniform Standards of Professional Appraisal Practice (USPAP).” An assessment is also an estimate of value of property, but the assessor need not be a professional appraiser.

When estimating the value of paleontological resources, it is important to enumerate the specific purpose for the evaluation, and the level of credibility and certainty required to support the intent and use of the evaluation. An appraisal or opinion of value for fossil specimens (personal property) or *in situ* paleontological resources (real property)

would have the highest level of credibility and certainty because it is prepared by and sworn to by a licensed or certified appraiser using uniform standards for appraisals. This level of certification may be required in litigation to satisfy evidentiary requirements and lands actions involving transfers of title. An assessment of value, whether for an estimate of value for fossil specimens (personal property) or *in situ* paleontological resources (real property), would have a lesser degree of credibility and certainty because it may be prepared by a resource specialist or other professional generally for management purposes.

REAL VS. PERSONAL PROPERTY

Real property is land (real estate) and any associated improvements or fixtures such as buildings and fences. Personal property is any property that is not real property and is usually movable and transportable. Intangible property, such as patents, stocks, and copyright (intellectual property), are also considered personal property. *In situ* paleontological resources are considered real property and part of the surface estate (real estate). Once the fossil specimen has been excavated and removed from the surface estate, it becomes personal property.

Appraisal and assessment of *in situ* paleontological resources may be associated with the evaluation of real property for federal lands actions, such as land sales or other land transfers, and evaluation of stewardship resources, or resource potential. Appraisals of fossil specimens (personal property) are usually associated with the need for certified value estimates for litigation involving fossil theft cases or resource damage assessments, and valuation of museum property.

APPRAISAL OF PROPERTY: STANDARD METHODS

There are three standard methods used for the appraisal of real and personal property: 1) the market-based or comparable sales method; 2) the cost approach; and 3) the income approach. In the comparable sales method, the opinion of fair-market value is based on the comparison of the subject property with other sales or transfers of property similar to the subject property. The cost approach uses the cost of replacement of the subject property with a similar property. In the income approach, the subject property’s ability to generate income is used to appraise its value when the subject property’s worth is the same as its income-producing potential. The comparable sales method may work best for the valuation of fossil specimens, especially in appraising

fossil specimens for litigation purposes or in estimating value of museum property. However, caution should be used when using the comparable sales method for establishing fair-market value for evidentiary purposes in litigation because proper documentation of legal sales of fossils may be difficult to find. In that case, the cost approach, i.e., using replacement costs of similar specimens available on the open market or current appraisals of museum property may be another alternative.

Highest and best use of the subject property is an important concept in the final opinion of value, especially in the appraisal of real property. The value added to the surface estate of *in situ* paleontological resources must be considered where there is known potential for the occurrence of paleontological resources. If a known fossil occurrence is proven to be an isolated occurrence, it may be easily excavated and recovered, and the opinion of value may exclude any potential for additional occurrences. In the context of personal property, highest and best use may be equated to the choice of the appropriate market, such as museum property, research, or educational use.

For a credible appraisal of real and personal property, the most current version of the “Uniform Standards of Professional Appraisal Practice” must be followed. An assessment of value in lieu of an appraisal may be adequate for internal agency actions; but to be acceptable in litigation, an opinion of value by a professional appraiser may be necessary. Table 1 summarizes the basic reporting requirements for an appraisal of personal property under Standard 8 for personal property of the “Uniform Standards of Professional Appraisal Practice.” The reporting requirements for an appraisal of real property under USPAP Standard 2 are similar.

ASSESSMENT OF VALUE

Assessment of paleontological resources involves the assessment of natural resource value which is a very intangible and subjective concept. For paleontological resources, natural resource values can be categorized into personal property values and real property values. In the first category, paleontological resources may be assessed for scientific or museum property values. In the second, paleontological resources may be assessed for stewardship value and resource potential.

Scientific value, or significance, is a subjective concept that for a paleontological resource would include its contribution and importance to the history of life on Earth, i.e., specimen-based significance; or its value as a type specimen or stratigraphic indicator, i.e., context-based significance. Under the Archaeological Resources Protection Act of 1969, a fossil specimen associated with cultural resources may have both scientific and heritage values. As of this writing, scientific significance of paleontological resources is a very much debated issue. Table 2 is an example of the USDA Forest Service’s effort to address the criteria for determining scientific significance of fossil resources for management purposes on National Forest System lands. In determining potential museum value of a fossil specimen, the degree of preservation of the specimen, its quality and completeness, and unique characteristics are all important. In addition, the amount of preparation and its exhibit potential are also important in assessing its museum value. Some costs typically associated with museum property are the costs of acquisition, replacement, preparation, curation, and exhibition.

Stewardship value is an important concept in the assessment of *in situ* paleontological resources. First, the land’s heritage asset value, i.e., its scientific, research, and educational values, must be recognized. Second, the cost of administration and management of these stewardship lands must be considered. Resource potential may be assessed by the probability or likelihood of a geologic formation to be favorable for the occurrence and preservation of paleontological resources. Table 3 shows the USDA Forest Service’s recommended classification of geological units based on the relative probability of finding paleontological resources that are of resource management concern. It is used as a planning tool for land-use planning and assessment of resource potential. The monetary value

TABLE 1. Summary of the requirements for an appraisal of personal property.

USPAP Standard 8: Personal Property Appraisal, Reporting

- Each appraisal report, oral or written, must clearly and accurately describe the appraisal so that it is not misleading; must contain enough information so that the users of the report understand it; and clearly and accurately disclose all assumptions, including any that are extraordinary, hypothetical or limiting.
- Each written appraisal must be prepared using one of the following three options, and state clearly which option is being used: Self-contained Appraisal Report, Summary Appraisal Report, or Restricted Use Appraisal Report. The self-contained appraisal report must contain:
 - The identity of the client and any intended users.
 - The intended use of the appraisal.
 - A description of the property to be appraised.
 - Any property interest to be appraised.
 - A statement of the type and definition of value.
 - The effective date of the appraisal and the date of the report.
 - A description of the scope of work used to develop the appraisal.
 - A clear statement of all extraordinary assumptions and hypothetical conditions, and any affect on the results of value.
 - A description of the information analyzed, the appraisal procedure followed, and the reasoning that supports the analyses, opinions, and conclusions.
 - Where appropriate, a statement of the use of the subject property at the date of valuation, as well as the use of the property reflected in the appraisal. When reporting an opinion of market value, describe the support and rationale for the appraiser’s opinion of the highest and best use of the property.
 - A statement and explanation of any permitted departures and the reasons for excluding any of the usual approaches of valuation.
 - Include a signed certification.
 - Each written appraisal must contain a signed certification with certain qualifying assertions.
 - Each oral appraisal report must at minimum address substantive matters as set forth under a Summary Appraisal Report.

of the resource can usually be inferred from actual expenditures to administer and manage the lands with its resource. But, it can also be estimated by quantifying what has been called, “stakeholder values,” i.e., the hypothetical cost of the willingness of any stakeholder to pay for the resource’s protection, preservation for future generations, or acquisition of lands for maximum protection.

The Federal Accounting and Standards Advisory Board (FASAB) has recognized stewardship resources, i.e., heritage assets and stewardship lands, as accountable federal property for which federal agencies are responsible to report on annually. Stewardship resources are usually coincident with the mission of the federal agency and associated with a resource protection mandate. As such, stewardship lands containing heritage assets have no revenue-generating value or potential as would timber or oil and gas resources. FASAB’s Statement of Federal Financial Accounting Standards (SFFAS) 29, July 2005, establishes the standards for the classification of heritage assets and stewardship lands, and how to report them. As defined by SFFAS 29, paleontologic resources can be considered federal heritage assets for their natural significance, educational importance, and value as museum property. Also under SFFAS 29, those lands containing *in situ* paleontological resources can be classified as stewardship lands. What is of interest in this discussion of federal accounting standards is the recognition of heritage assets that are unique for their natural significance and educational importance, the need for the federal government to be accountable for those assets, and the expectation for management and protection of these assets in perpetuity.

TABLE 2. USDA Forest Service Scientific Significance Criteria for Fossil Resources.

Specimen-based criteria:

1. Represents an unknown or undescribed/ unnamed taxon of invertebrate, plant or vertebrate.
2. Represents a rare taxon, or rare morphological/ anatomical element or feature of invertebrate, plant or vertebrate. The “rareness” criterion comprises either absolute rareness in the fossil record, or relative or contextual rareness as described below.
3. Represents a vertebrate taxon.
4. Exhibits an exceptional type and/or quality of preservation.
5. Exhibits remarkable or anomalous morphological/anatomical character(s) or taphonomic alteration.
6. Represents “soft tissue” preservation or presence of invertebrate, plant or vertebrate.
7. Exhibits cultural affiliation, e.g., alteration or use by ancient man.

Context-based criteria:

1. Is associated in a relevant way with other evidence of scientific interest, providing taphonomic, ecologic, environmental, behavioral, cultural or evolutionary information.
2. Is evidence that extends and/or constrains the stratigraphic, chronologic and/ or geographic range of a taxon or functional paraphyletic group.

TABLE 3. USDA Forest Service Fossil Yield Potential Classification.

Class 1. Igneous and metamorphic geologic units (excluding volcanic ash) that are not likely to contain identifiable fossil remains.

Class 2. Sedimentary geologic units which are not likely to contain vertebrate fossils or scientifically significant non-vertebrate (invertebrate and plant) fossils.

Class 3. Fossiliferous geologic units whose fossil content varies in significance, abundance, and predictable occurrence. Sedimentary units or volcanic ash with unknown fossil potential are included in this class.

Class 4. Class 4 geologic units are Class 5 units (see below) that have lowered risks of human-caused adverse impacts, resource conflicts, or natural degradation. May also include units with isolated fossil occurrences that can be mitigated by recovery.

Class 5. Fossiliferous geologic units that regularly and predictably yield vertebrate fossils or scientifically significant non-vertebrate fossils, and that are at risk of natural degradation, resource conflicts, and/or human-caused adverse impacts.

Note: The classification is assigned by a qualified professional to geologic units based on information gathered from a literature search, geologic maps, and field verification.

Appraisal of Museum Property

Once a fossil specimen has been removed from the ground, i.e., it is no longer an *in situ* paleontological resource, and usually becomes a

part of a university or museum collection or exhibit. As museum property, certain standards for the curation of fossil specimens and their valuation are applied in accordance with a museum’s collection management plan and requirements under museum accreditation standards. Generally, appraisals of museum property are required when a specimen or collection is loaned, transferred or exchanged, or otherwise deaccessioned, or when valuing a donation for tax purposes. In some instances, museum property may be classified as controlled property of high value and would require an appraisal for insurance purposes. A current appraisal will provide the best opinion of market value in case of theft. In his 2000 paper in “Cultural Resources Management,” Dan Chure revealed the insidious theft of vertebrate fossils from museum collections as the result of increasing fossil trafficking and their value.

Resource Damage Assessments

Resource damage assessments are not opinions or assessments of value. However, in the management and protection of paleontological resources, the resource damage assessment is an important tool for as-signing cost, and hence a type of “value,” for the damage, vandalism, loss, and destruction of natural resources. These costs typically include the costs of restoration, repair, or replacement of the resource and its immediate environs; the loss of scientific value or loss of use of the resource; the cost of response for professionals and law enforcement; cost of preparation, excavation, and conservation; cost of monitoring; cost of litigation, cost of an appraisal or assessment, and cost of report preparation. Associated costs considered in the damage assessment would take into account direct and indirect costs such as labor, equipment and supplies, travel, and overhead. Table 4 contains a list of some common direct and indirect costs, and costs associated with the assessment of resource damage.

TABLE 4. Business and associated costs.

Business costs**Direct costs:**

- Labor, including fringe benefits
- Travel
- Equipment
- Materials and supplies
- Support: computer software, telephone
- Regulatory costs – fees and related costs

Indirect costs:

Overhead – rent, utilities, technical support, manager oversight, etc.

Costs associated with damage – in addition to business costs

Cost of response – by professional and law enforcement, etc.

Cost of inventory

Cost of salvage, including excavation, preparation, transportation, conservation, storage

Cost of restoration, including stabilization, reseeded, protective barriers, etc.

Cost of repair or replacement

Cost of loss, either scientific value or use

Cost of report preparation

Cost of monitoring

Cost of litigation

Cost of appraisal

SUMMARY AND CONCLUSION

Value is the worth or desirability of the subject property. An appraisal is a professional opinion of fair-market value of the subject property in space and time. An assessment is the process of placing an estimate of value on the subject property usually for management purposes. Costs are the time, money and resources expended to manage the subject property, and can be equated to value where that value is intangible. For paleontological resources, there are no questions about the scientific, research, and educational values of these resources. Many times resource specialists are called upon to put a monetary value to a fossil specimen that is stolen, or a stewardship land value, i.e., a natural resource value, that may be vandalized or exchanged. Some of the most

irreparable crimes committed on federal lands are the vandalism and theft of paleontological, archaeological, and cultural resources. Yet, they are the hardest crimes to prosecute and get a conviction. Establishing formal guidelines for the appraisal and assessment of paleontological resources especially for litigation is sorely needed in the paleontology community. This paper is an attempt to open a dialogue for more discussion on how to quantify the value of federal paleontological resources so that land managers can better aid in their management and protection.

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